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NON-GENETIC ADJUSTMENTS TO GROWTH RATE IN A PERFORMANCE TESTING SCHEME FOR TERMINAL MEATSHEEP SIRES

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The N.S.W. Meatsheep Testing Service (MSTS) provides breeders with objective information on hogget growth rate and fat depth of rams (Harris and Luff 1981; Harris 1985). This allows more efficient selection programs to be implemented to improve growth and leanness in studs and provides objective information for ram buyers. The MSTS has been developed by the N.S.W. Department of Agriculture with financial support from the Australian Meat Research Committee. In 1984 15,000 sheep were measured by the Service from 108 studs, with 38% of all Poll Dorset and shortwool British breed rams sold in N.S.W. being measured for growth rate and fat depth. More important genetically, some 80% of the influential studs in N.S.W. are utilizing the Service.

Weight of rams within a management group is influenced by the non-genetic effects of age, age of dam and type of birth/rearing. Adjustments of ram weights for these known environmental effects improves the estimate of breeding value and hence the efficiency of selection (Gregory et. al. 1978). The MSTS uses standard adjustments to growth rate from birth to hogget (8-15 months), for age of dam (maiden v adult) and type of birth/rearing. Adjusted growth rate is expressed as a percentage deviation from the flock or group mean (100%) and individual animals are ranked. This paper reports variation in the magnitude of age of dam and type of birth/rearing effects between studs and examines the effects on selection efficiency of different adjustment methods.

MATERIALS AND METHODS

The data comprise 4594 hogget weights for 30 ram groups born in 1982-84 in 22 studs processed by the MSTS (Table 1). The studs are located throughout N.S.W. and are all Dorset Horn or Poll Dorset except for one South Suffolk. Approximately 3% of rams were deleted from the data set because their age of dam was unknown or they were not born and reared as singles or twins.

Table 1. Characteristics of the data set.

Number of ram groups	30
Rams/group	150 range (76-260)
Group mean age (days)	277 range (157-467)
Group mean single weight (kg)	51.9 range (30.2-78.0)

Within each group, ram weight was fitted with a general linear model containing the effects of Age (days), Age of Dam (AD) (maiden v adult), Type of Birth/Rearing (TBR) (1 v 2) and the interaction AD x TBR. Age of dam effects for singles and twins were calculated as the ratio of least square means for adult and maiden dams and similarly for type of birth/rearing effect as the ratio of single and twin rams for adult and maiden dams.

RESULTS

Single rams from adult ewes were 2.2% heavier than those from maiden ewes but the effect ranged from -4.3 to 9.3% amongst the 30 groups (Table 2). The effect amongst twin rams was slightly higher and more variable. The number of twin rams from maiden ewes was small in many of the groups and the twin estimate is less reliable than that for singles. The type of birth/rearing effect was 8.3% amongst rams from adult ewes with a range of 1.0 to 18.4%. The effect for maiden ewes was slightly larger and more variable (Table 2). The interaction between dam age and type of birth/rearing was small and not significant for most groups.

There was a considerable range in mean age and mean weight of ram groups analysed (Table 1). The regression of type of birth/rearing effect on mean age was significant ($P<0.1$, Table 2). For every increase of 10 days in mean group age the type of birth/rearing (adult) effect declined by .26%. Similarly for every 1kg increase in mean group weight there was a decline in the effect by .16% ($P<.05$). Similar regressions for the age of dam effect were small and not significant.

Table 2. Non-genetic effects for ram hogget weight in 30 ram groups.

Effect	Mean ± SE	Range
Age of dam - singles	1.022 ± .006	(.957 - 1.093)
- twins	1.033 ± .010	(.948 - 1.243)
Type of birth/rearing (TBR)		
- adult	1.083 ± .008	(1.010 - 1.184)
- maiden	1.095 ± .012	(.941 - 1.318)
Regressions- TBR on group mean age and weight		
b_{age} = -.00026 ± .00009	$\times 10^{-2}$/day	
b_{weight} = -.0016 ± .0006	$\times 10^{-2}$/kg	

DISCUSSION

Currently the MSTS adjusts growth rate by adding 2% for maiden dams and 3% for rams born and reared as twins. The present results show that the age of dam adjustment is reasonable but the type of birth/rearing adjustment is too low for most groups. The effect of this under adjustment on growth percentage and ranking of rams was examined by re-running the data for each group using the mean 7.2% adjustment for twin rams (allowing for 1.1% inbuilt adjustment for birthweight difference). In addition each group was adjusted using the within group effects for age of dam and type of birth. These latter adjustments are considered the best estimates of breeding value for the rams and on average were highly correlated with the other two methods of adjustment for both growth percentage and rank (Table 3).

Table 3. Mean correlations and range between three adjustment methods for growth percentage and rank for 30 ram groups[a]

	1. MSTS standard	2. Data mean	3. Within group
1.		.986 (.966-.995)	.971 (.883-.997)
2.	.982 (.969-.993)		.981 (.896-.999)
3.	.965 (.843-.996)	.977 (.861-.999)	

[a]Growth percentage above diagonal and rank below diagonal.

The real impact of inadequate adjustments is on the loss of potential selection differential because the real breeding value of selected rams is lower than that of rams that would have been selected if efficient adjustments for environmental effects had been made. A recommended breeding program for flocks in this data set (250 to 1000 ewes) would involve selection of approximately five rams per year. The selection differential for each ram group in terms of growth percentage was calculated for the top five rams using within group adjustments. The loss in selection differential was then calculated by selecting the top five rams when adjustments had been made using the current MSTS values and the data mean effects. There was no difference in the selection differentials using the three adjustment methods for two thirds of the groups. In the remainder of the groups there was a loss of 1 to 2 percentage points for each adjustment method. The results of this study show that despite the large variation between groups in magnitude of age of dam and type of birth/rearing effects there is little loss in selection differential thrpugh the use of standard adjustments for these effects.

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